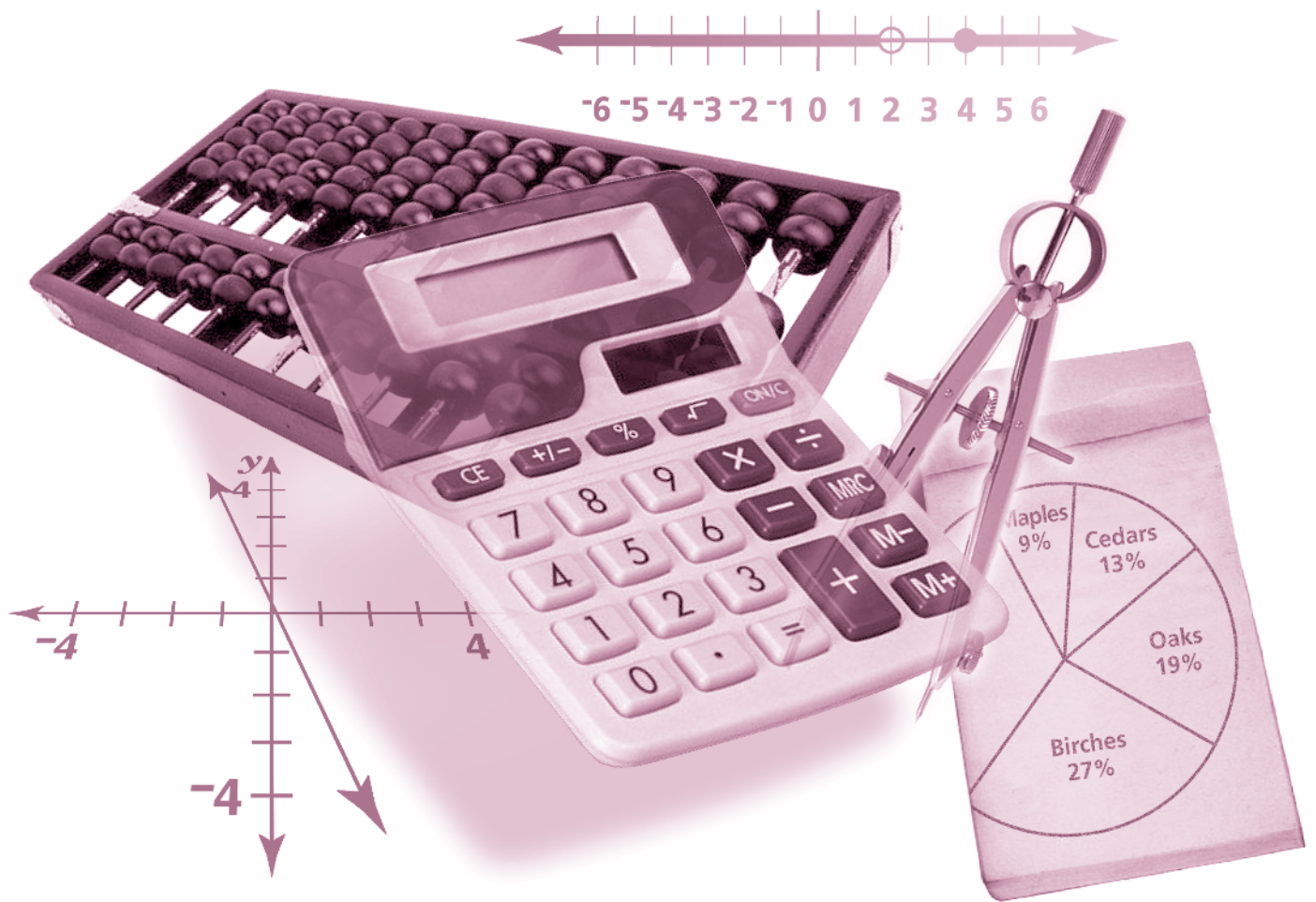


# TENNESSEE

## Gateway Assessment

### Item Sampler



## Mathematics

# Gateway Mathematics Reference Page

## Perimeter (P) and Circumference (C)

Any Polygon:  $P = \text{sum of side lengths}$   
 Rectangle:  $P = 2\ell + 2w$   
 Circle:  $C = 2\pi r$  or  $\pi d$   
 $\pi \approx 3.14$  or  $\frac{22}{7}$

## Abbreviations

$A$  = area       $d$  = diameter       $r$  = radius  
 $B$  = area of base       $h$  = height       $s$  = length of side  
 $b$  = base       $\ell$  = length       $V$  = volume  
 $C$  = circumference       $P$  = perimeter       $w$  = width

## Plane Figures

## Area (A)

Triangle



$$A = \frac{1}{2}bh$$

Rectangle



$$A = \ell w$$

Circle



$$A = \pi r^2$$

$$\pi \approx 3.14 \text{ or } \frac{22}{7}$$

## Quadratics

For  $ax^2 + bx + c = 0$  :

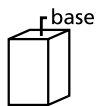
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Discriminant =  $b^2 - 4ac$

## Solid Figures

## Volume (V)

Right  
Rectangular  
Prism



$$V = Bh$$

or

$$V = \ell wh$$

Cube



$$V = s^3$$

$$d = rt$$

distance = rate  $\times$  time

Distance Formula:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$d$  = distance between  
two points

Slope Formula:

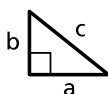
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Slope-Intercept Equation:  $y = mx + b$

Point-Slope Equation:  $y - y_1 = m(x - x_1)$

Pythagorean Theorem:

$$a^2 + b^2 = c^2$$



$n$	$\sqrt{n}$	$n^2$
1	1.000	1
2	1.414	4
3	1.732	9
4	2.000	16
5	2.236	25
6	2.449	36
7	2.646	49
8	2.828	64
9	3.000	81
10	3.162	100
11	3.317	121
12	3.464	144
13	3.606	169
14	3.742	196
15	3.873	225
16	4.000	256
17	4.123	289
18	4.243	324
19	4.359	361
20	4.472	400
21	4.583	441
22	4.690	484
23	4.796	529
24	4.899	576
25	5.000	625

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# Introduction to Gateway Math

## Content of Tests

The testing program titled the *Tennessee Gateway Assessment* was established to meet the Tennessee mandate for high stakes, end-of-course assessments in Tennessee secondary schools. These tests measure the Tennessee Performance Indicators. Subject areas covered by the testing program include Mathematics, Language Arts, and Science.

## Test Development

For the *Tennessee Gateway Assessment*, a staff of writers—composed of both teachers and professional test developers experienced in each of the content areas—researched and wrote the items. Professional editors and content specialists carefully reviewed all items and test directions for content and accuracy. To provide a large pool of items for final test selection, the test developers created approximately twice as many items as were needed in the final editions of the tests.

After tryout tests were administered, student responses were analyzed. Professional content editors and researchers carefully reviewed items, their data, and test directions for content, suitability, and accuracy before including particular items and test directions in operational tests.

## Test Administration

*Tennessee Gateway Assessments* are given to students as they near the end of courses that are included in the program. Tests may be given midyear for block schedules or near the end of the school year.

Each test contains 62 multiple-choice questions.

Students will have ample time to read and answer each of the questions. Each test has been designed to be administered in one session and is untimed.

Calculator use is optional. Sharing calculators during testing is not permitted.

The following types of calculators/devices may NOT be used during the test:

- pocket organizers
- electronic writing pads or input devices
- Some examples of prohibited calculators are:
  - Casio models: CFX-9970G, Algebra FX 2.0
  - Hewlett-Packard models: HP-40G, HP-49G
  - Texas Instruments models: TI-89, TI-92, Voyage 200
- calculators that can communicate (transfer data or information) wirelessly with other student calculators/devices
- cell phones, PSPs™, and/or iPods®

Students may use any four-function, scientific, or graphing calculator that does not have any of the above features.

## Tips for Students Taking the Test

### Preparing for the test

- Review this Tennessee Gateway Item Sampler for Math carefully and thoroughly.
- Acquire a Tennessee Gateway Practice Test for Math, and take the test several times.
- Become familiar with the correct way to mark answers on the answer sheet. There is a sample answer sheet in the Practice Test.

### Before the test

- Get a good night's sleep. To do your best, you need to be rested.

### During the test

- Relax. It is normal to be somewhat nervous before the test. Try to relax and not worry.
- Listen. Listen to and read the test directions carefully. Ask for an explanation of the directions if you do not understand them.
- Plan your time. Do not spend too much time on any one question. If a question seems to take too long, skip it and return to it later. Answer all questions you are sure of first.
- Think. If you are not sure how to answer a question, read it again and try your best to answer the question. Rule out answer choices that you know are incorrect and choose from those that remain.

## Directions for Using the Item Sampler

This Item Sampler for Math provides specific information to students and teachers. It contains examples of different item types for each Performance Indicator that may be tested in any given Gateway test administration. Performance Indicators have been grouped under Reporting Categories. These Reporting Categories will be used to report information regarding performance on the Gateway tests to students, teachers, schools, and systems.

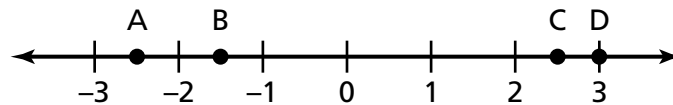
The items in this Item Sampler will not be found in the Gateway tests. The number of items in this Item Sampler does not reflect the emphasis of content on the test. In order to identify the emphasis of content, the Gateway Assessment Practice Test for Math should be used. The Practice Test gives a better representation of content emphasis across Reporting Categories and Performance Indicators.

An Answer Key is located on page 59. Use it to check your answers. Review items that you get wrong.

**Reporting Category 1: Number Sense/Theory**  
**Numbers 1 through 14**

**Performance Indicator:** Select the best estimate for the coordinate of a given point on a number line (only rational).

- 1** Which point on the number line is closest to  $-2\frac{7}{16}$ ?



- A** Point A
- B** Point B
- C** Point C
- D** Point D

GM010062

**Performance Indicator:** Identify the opposite of a rational number.

- 2** What is the opposite of  $-0.65$ ?

- F**  $-0.56$
- G**  $-0.35$
- H**  $0.13$
- J**  $0.65$

GM010179

**Performance Indicator:** Determine the square root of a perfect square less than 169.

- 3** What is the square root of 100?

- A** 10
- B** 20
- C** 50
- D** 10,000

GM010379



**Performance Indicator:** Order a given set of rational numbers (both fraction and decimal notations).

**4** Which of these sets of numbers is ordered from least to greatest value?

**F**  $\left\{0.25, \frac{3}{8}, -\frac{1}{2}, -0.625\right\}$

**G**  $\left\{-\frac{1}{2}, -0.625, \frac{3}{8}, 0.25\right\}$

**H**  $\left\{-0.625, -\frac{1}{2}, 0.25, \frac{3}{8}\right\}$

**J**  $\left\{0.25, -\frac{1}{2}, \frac{3}{8}, -0.625\right\}$

GM010181

**5** Which of the given sets of numbers is ordered from greatest to least value?

**A**  $\left\{-4, -\frac{4}{3}, -\frac{2}{3}, 0\right\}$

**B**  $\left\{0, -\frac{2}{3}, -\frac{4}{3}, -4\right\}$

**C**  $\left\{0, -\frac{4}{3}, -\frac{2}{3}, -4\right\}$

**D**  $\left\{0, -\frac{2}{3}, -4, -\frac{4}{3}\right\}$

GM010281

**Performance Indicator:** Identify the reciprocal of a rational number.

**6** What is the reciprocal of 4.5?

**F**  $-4.5$

**G**  $-3.5$

**H**  $\frac{2}{9}$

**J**  $\frac{9}{2}$

GM020058

**Performance Indicator:** Select ratios and proportions to represent real-world problems (e.g., scale drawings, sampling, etc.).

**7** When Aaron walks, he burns 15 calories in 3 minutes. He wants to calculate how many calories he will burn if he walks at the same rate for 45 minutes. Which of these proportions should Aaron use to calculate how many calories he will burn in 45 minutes?

**A**  $\frac{3}{15} = \frac{n}{45}$

**B**  $\frac{15}{45} = \frac{3}{n}$

**C**  $\frac{3}{45} = \frac{n}{15}$

**D**  $\frac{15}{3} = \frac{n}{45}$

GM010183

- 8** There are 14 female students and 10 male students in Ms. Martinez’s geometry class. What is the ratio of male students to the total number of students?

**F** 7 to 5  
**G** 7 to 12  
**H** 5 to 12  
**J** 5 to 7

GM020101

- 9** John is making miniature buildings for a movie set model. The actual buildings are 25 times larger than the model buildings. John wants to make a model of a building which has an actual height of 300 feet. What should be the height, in feet (ft), of the model?

**A** 12 ft  
**B** 25 ft  
**C** 275 ft  
**D** 325 ft

GM010111

**Performance Indicator:** Apply order of operations when computing with integers using no more than two sets of grouping symbols and exponents 1 and 2.

- 10** Simplify:  $(8 - 2)^2 + 8^2 \div 2 - 13$

**F** 55  
**G** 37  
**H** 23  
**J** 21

GM010068

- 11** Which of these lists the correct order of operations to simplify the expression below?

$$100 - 32 \div 2 \bullet 8 + 3$$

- A** subtract, divide, multiply, add
- B** multiply, divide, add, subtract
- C** divide, multiply, subtract, add
- D** add, multiply, divide, subtract

GM010226

**Performance Indicator:** Select a reasonable solution for a real-world division problem in which the remainder must be considered.

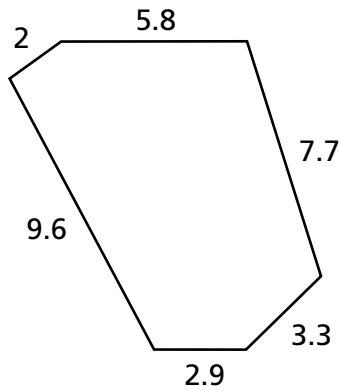
- 12** The buses at a school can fit no more than 36 passengers per bus. There will be 68 students, 5 teachers, and 5 parents riding buses on a field trip to the natural history museum. What is the minimum number of buses needed?

- F** 2
- G** 3
- H** 4
- J** 5

GM010113

**Performance Indicator:** Use estimation to determine a reasonable solution for a tedious arithmetic computation.

- 13** Which estimate is closest to the perimeter of the hexagon?



- A** 36 units
- B** 32 units
- C** 26 units
- D** 22 units

GM010114

- 14** Cherise wants to leave an 18% tip for a restaurant bill totaling \$69.59. Which estimate is closest to the whole dollar amount Cherise should include as a tip?

- F** \$7
- G** \$9
- H** \$14
- J** \$18

GM010186

**Reporting Category 2: Algebraic Expressions**  
**Numbers 15 through 25**

**Performance Indicator:** Use exponents to simplify a monomial written in expanded form without the use of parentheses.

**15** Simplify:  $2 \bullet 2 \bullet 2 \bullet x \bullet x \bullet y \bullet y$

- A**  $6x^2y^2$
- B**  $8x^2y^2$
- C**  $6 + 2x + 2y$
- D**  $8 + 2x + 2y$

GM020007

**Performance Indicator:** Add and subtract algebraic expressions.

**16** Which expression is equivalent to  $(-2x + 5) - (-3x + 2)$ ?

- F**  $x + 3$
- G**  $x + 7$
- H**  $-5x + 3$
- J**  $-5x + 7$

GM020256

**17** Which of the following is equivalent to  $(-6x^4 - 9x^3 - 2x) + (-3x^3 - 2x^2 + x)$ ?

- A**  $-6x^4 - 6x^3 + 2x^2 - 3x$
- B**  $-6x^4 - 12x^3 - 2x^2 - x$
- C**  $-6x^4 - 12x^3 + 2x^2 - 3x$
- D**  $-9x^4 - 11x^3 - x$

GM010271

**Performance Indicator:** Multiply two polynomials with each factor having no more than two terms.

**18** Simplify:  $(7x - 1)(2x + 5)$

**F**  $14x^2 + 33x - 5$

**G**  $14x^2 - 33x - 5$

**H**  $14x^2 + 37x + 5$

**J**  $14x^2 - 14x - 5$

GM010072

**Performance Indicator:** Select the area representation for a given product of two one-variable binomials with positive constants and coefficients.

**19** Which of these figures is an area representation of  $(3x + 3)$  multiplied by  $(2x + 2)$ ?

$x^2$	$x^2$	$x^2$	$x$	$x$	$x$
$x^2$	$x^2$	$x^2$	$x$	$x$	$x$
1	1	1			

**A**

$x^2$	$x^2$	1	1
$x^2$	$x^2$	1	1
$x^2$	$x^2$	1	1

**C**

$x^2$	$x^2$	$x^2$	$x$	$x$	$x$
$x^2$	$x^2$	$x^2$	$x$	$x$	$x$
$x$	$x$	$x$	1	1	1
$x$	$x$	$x$	1	1	1

**B**

$x^2$	$x^2$	$x^2$	$x$	$x$
$x^2$	$x^2$	$x^2$	$x$	$x$
$x$	$x$	$x$	1	1
$x$	$x$	$x$	1	1
$x$	$x$	$x$	1	1

**D**

GM010156

**Performance Indicator:** Extend a numerical pattern.

- 20** What is the missing number in the skip-counting pattern below?

12, 6, 11, 5, 10,    ? , 9, 3, 8, 2

- F** 4
- G** 5
- H** 15
- J** 16

GM010077

- 21** What is the next number in the Fibonacci sequence shown below?

. . . , 8, 13, 21, 34, 55,    ?

- A** 63
- B** 68
- C** 76
- D** 89

GM020030

**Performance Indicator:** Translate a verbal expression into an algebraic expression or vice versa.

- 22** The statement “8 multiplied by the sum of a number  $n$  and 7” is represented by which of the following expressions?

- F**  $8(7n)$
- G**  $8(n + 7)$
- H**  $8n + 7$
- J**  $8 + 7 + n$

GM010038



- 23** Joe is 4 years younger than twice Bob's age. If  $b$  represents Bob's age, which expression represents Joe's age?

**A**  $4 - 2b$   
**B**  $4b + 2$   
**C**  $2b - 4$   
**D**  $2b + 4$

GM010039

**Performance Indicator:** Evaluate a first-degree algebraic expression given values for one or more variables.

- 24** What is the value of  $6a - 5b - 4$  when  $a = -3$  and  $b = 5$ ?

**F**  $-47$   
**G**  $-11$   
**H**  $3$   
**J**  $4$

GM010040

**Performance Indicator:** Evaluate an algebraic expression given values for one or more variables using grouping symbols and/or exponents less than four.

- 25** Evaluate  $\frac{1}{2}x^2y^3$  when  $x = 3$  and  $y = 2$ .

**A**  $18$   
**B**  $36$   
**C**  $54$   
**D**  $243$

GM010140

**Reporting Category 3: Equations and Inequalities**  
**Numbers 26 through 39**

**Performance Indicator:** Solve one- and two-step linear equations using integers (with integral coefficients and constants).

**26** Solve:  $5x - 20 = 60$

**F**  $-16$

**G**  $-4$

**H**  $8$

**J**  $16$

GM010165

**Performance Indicator:** Select the algebraic notation which generalizes the pattern represented by data in a given table.

**27** Vanessa pays her brother \$5 for driving her to a babysitting job. After paying her brother, her earnings are determined by the number of hours she works, as shown in the table below.

Number of hours worked ( $h$ )	Amount earned ( $a$ )
1	3
2	11
3	19
4	27

Which equation generalizes the pattern of Vanessa's earnings?

**A**  $a = h + 2$

**B**  $a = h + 8$

**C**  $a = 8h - 5$

**D**  $a = 8h + 5$

GM020234

**Performance Indicator:** Translate a verbal sentence into an algebraic equation or vice versa.

- 28** Joseph rode his bicycle for 10 miles and then increased his rate of speed to an average of 15 miles per hour for the next  $h$  hours. Which equation represents  $D$ , the total distance Joseph rode his bicycle?

**F**  $D = 10h + 15$

**G**  $D = 25h$

**H**  $D = 15h - 10$

**J**  $D = 15h + 10$

GM010371

- 29** Which of these situations could be represented by the equation  $6f = 60$ ?

**A** The product of 6 and  $f$  is equal to 60.

**B** The sum of 6 and  $f$  is equal to 60.

**C** The difference between 6 and  $f$  is equal to 60.

**D** The quotient of 6 and  $f$  is equal to 60.

GM010313

**Performance Indicator:** Solve multi-step linear equations (more than two steps, variables on one side of the equation with no use of parentheses).

- 30** Solve:  $5x - 2 - 3x + 4 = 3$

**F**  $\frac{1}{8}$

**G**  $\frac{1}{2}$

**H**  $\frac{5}{8}$

**J**  $\frac{5}{2}$

GM010143

**Performance Indicator:** Solve multi-step linear equations (more than two steps, with variables on both sides of the equation with no use of parentheses).

**31** Solve:  $3x - 10 = 4x - 16 - 2$

**A**     $-28$

**B**     $-8$

**C**     $8$

**D**     $28$

GM010083

**Performance Indicator:** Solve multi-step linear equations (more than two steps, with one set of parentheses on each side of the equation).

**32** Solve for  $x$ :  $4(x - 1) = 2(x + 9)$

**F**     $4$

**G**     $5$

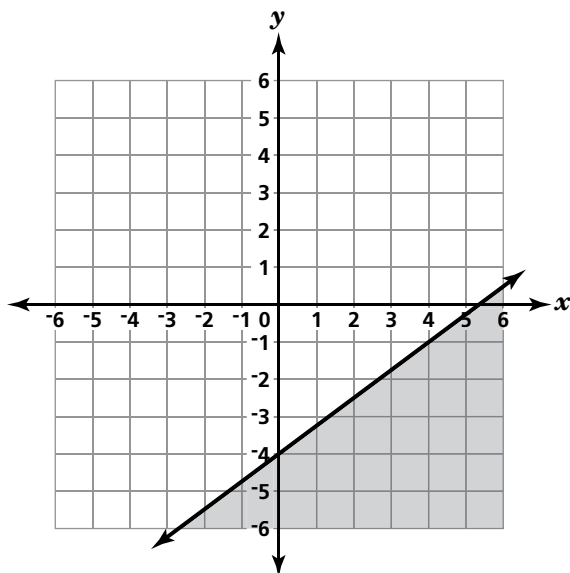
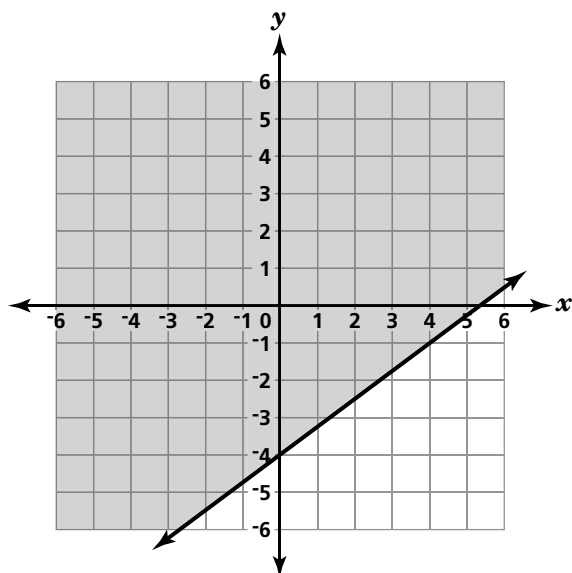
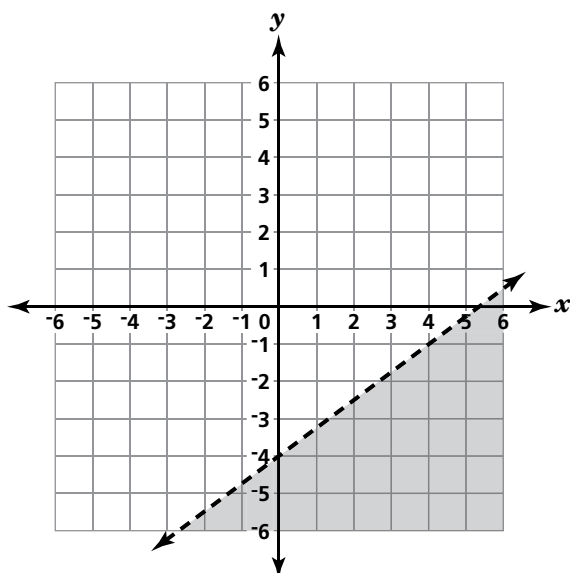
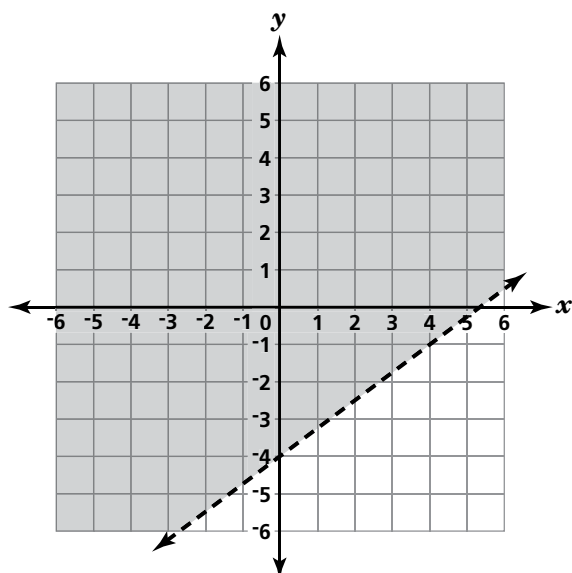
**H**     $7$

**J**     $11$

GM020068

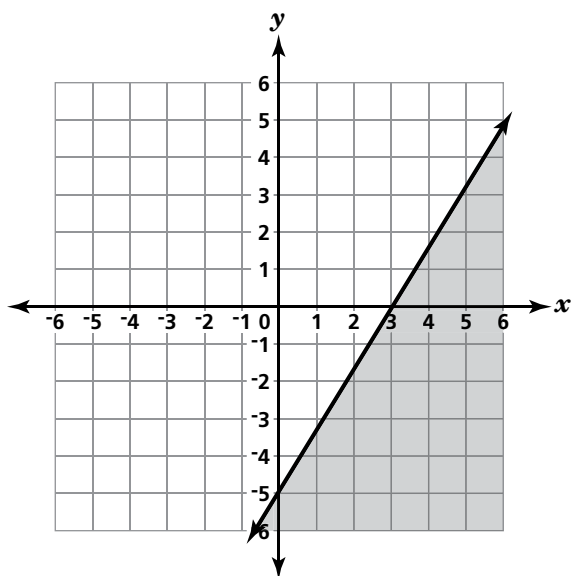
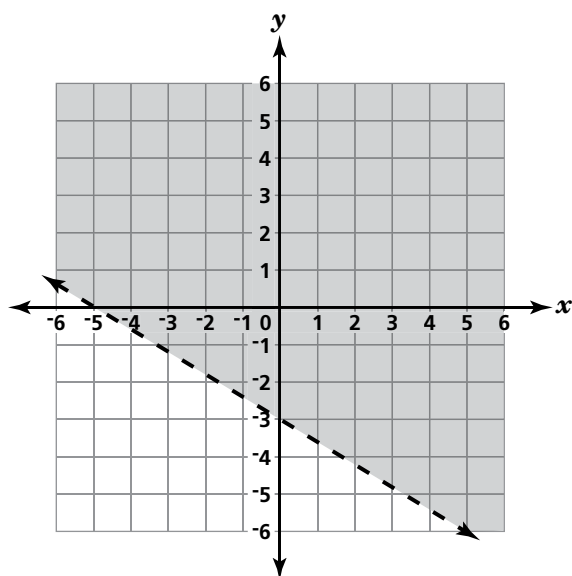
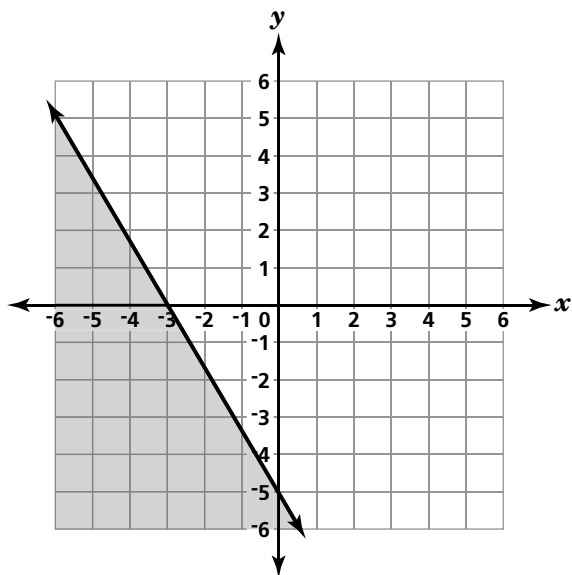
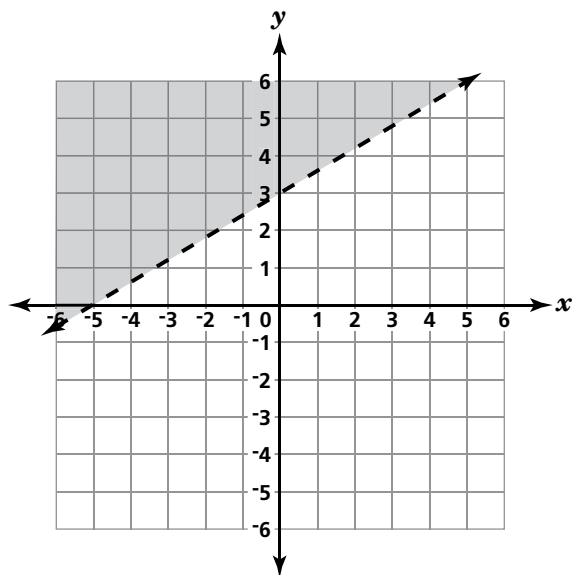
**Performance Indicator:** Select the appropriate graphical representation on the coordinate plane of a given linear inequality (given in standard form or slope-intercept form).

- 33** Which of these graphs best represents  $y \leq \frac{3}{4}x - 4$ ?

**A****C****B****D**

GM010261

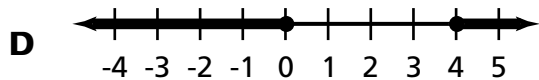
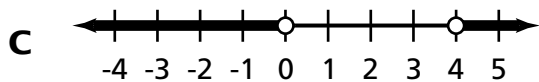
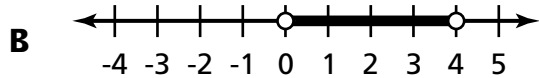
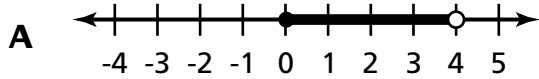
- 34 Which of these represents the graph of  $3x - 5y < -15$ ?

**F****H****G****J**

GM010318

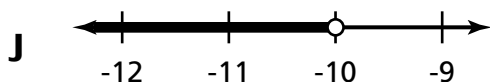
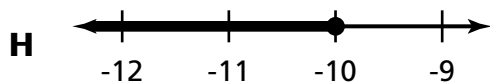
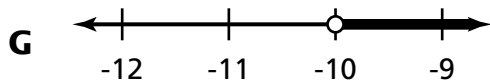
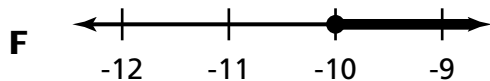
**Performance Indicator:** Identify the graphical representation of the solution to a one-variable inequality on a number line.

**35** Which of these graphs represents  $x < 0$  or  $x > 4$ ?



GM010325

**36** Which graph illustrates  $x \geq -10$ ?



GM010215

**Performance Indicator:** Find the solution to a quadratic equation given in standard form (integral solutions and a leading coefficient of one).

**37** Solve for  $x$ :  $x^2 + x - 42 = 0$

- A**  $-7$  and  $-6$
- B**  $-7$  and  $6$
- C**  $7$  and  $-6$
- D**  $7$  and  $6$

GM020215

**Performance Indicator:** Select one of the factors (e.g.,  $x + 3$ ) of a quadratic equation (integral solutions and a leading coefficient of one).

**38** Which binomial is a factor of  $x^2 + 2x - 24 = 0$ ?

- F**  $(x + 2)$
- G**  $(x + 3)$
- H**  $(x + 4)$
- J**  $(x + 6)$

GM020072

**Performance Indicator:** Select the discriminant of a quadratic equation (integral solutions and a leading coefficient of one).

**39** What is the discriminant of  $y^2 - 8y + 12 = 0$ ?

- A**  $16$
- B**  $12$
- C**  $8$
- D**  $4$

GM020195



**Reporting Category 4:** Real-World Problems  
Numbers 40 through 53

**Performance Indicator:** Apply the concept of slope to represent rate of change in a real-world situation.

- 40** For the last 6 years, Jeremiah has been tracking his development as a baseball pitcher. According to his records, he pitches 15 miles per hour faster than he could 2 years earlier. Which expression represents the average rate of change of the speed of Jeremiah's pitches?

**F**  $\frac{2}{15}$

**G**  $\frac{6}{15}$

**H**  $\frac{15}{6}$

**J**  $\frac{15}{2}$

GM020196

- 41** Elise drove to the state capital yesterday. The table below shows the number of hours that Elise spent driving and the number of miles driven.

Time (in hours)	Miles Driven
0.5	24
1	48
1.5	72
2	96
2.5	120
3	144

Based on the data in the table, which expression represents the average speed during Elise's drive to the state capital?

- A**  $\frac{144 - 24}{3 - 0.5}$
- B**  $\frac{144 - 3}{24 - 0.5}$
- C**  $\frac{3 - 0.5}{144 - 24}$
- D**  $\frac{24 - 0.5}{144 - 3}$

GM020102

**Performance Indicator:** Calculate rates involving cost per unit to determine the best buy (no more than four samples).

- 42** The table below shows the prices for three different types of candy.

Candy	Size	Price
Jelly beans	5 pounds	\$18.75
Sour balls	8 pounds	\$29.60
Gum balls	10 pounds	\$38.00

Which of the following statements is true?

- F** Jelly beans are the most expensive per pound.
- G** Sour balls are the least expensive per pound.
- H** Jelly beans cost more per pound than gum balls.
- J** Gum balls and sour balls cost the same per pound.

GM010029

**Performance Indicator:** Apply the concept of rate of change to solve real-world problems.

- 43** Steve can run 3 miles in 20 minutes. At this rate, how many miles can he run in 30 minutes?

- A** 3.5 mi
- B** 4.0 mi
- C** 4.5 mi
- D** 5.0 mi

GM020274

**Performance Indicator:** Solve multi-step linear inequalities in real-world situations.

- 44** Hector takes 6 minutes to iron a shirt and 10 minutes to fold a load of laundry. He has 90 minutes to iron and fold laundry before football practice. This can be modeled by the inequality below:

$$6s + 10n \leq 90$$

Which ordered pair  $(s, n)$  satisfies the inequality?

**F**  $(3, 10)$

**G**  $(9, 3)$

**H**  $(13, 2)$

**J**  $(16, 0)$

GM020149

- 45** Henry scored 81 points and 89 points in his first two rounds of bowling. He wants to obtain a bowling average that is at least 90 points. This can be modeled by the inequality below.

$$\frac{81 + 89 + w}{3} \geq 90$$

Which inequality represents  $w$ , the score Henry needs in the third round to obtain an average that is at least 90 points?

**A**  $w \geq 85$

**B**  $w \geq 93$

**C**  $w \geq 97$

**D**  $w \geq 100$

GM020303

**Performance Indicator:** Determine the mean (average) of a given set of real-world data (no more than five two-digit numbers).

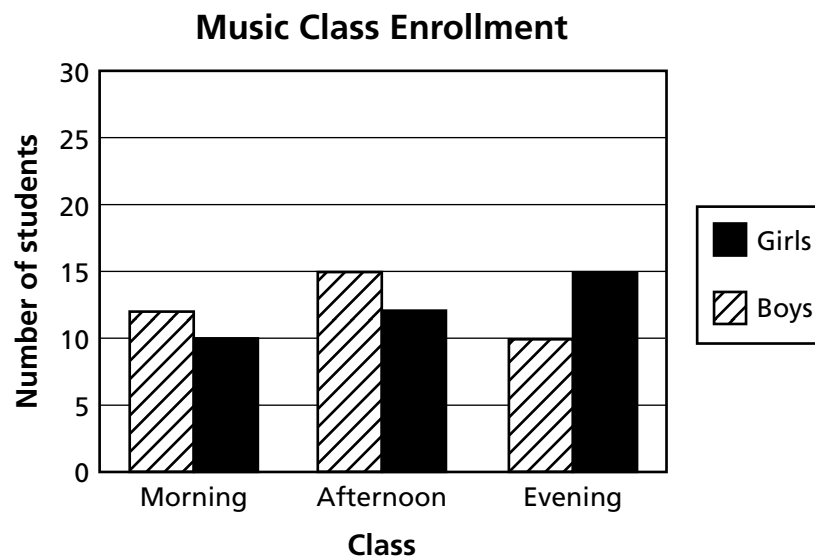
- 46** The high temperature over 5 consecutive days in Tucson, Arizona, was 99°F, 96°F, 94°F, 93°F, and 93°F. What was the mean high temperature?

**F** 93°F  
**G** 94°F  
**H** 95°F  
**J** 99°F

GM010189

**Performance Indicator:** Interpret bar graphs representing real-world data.

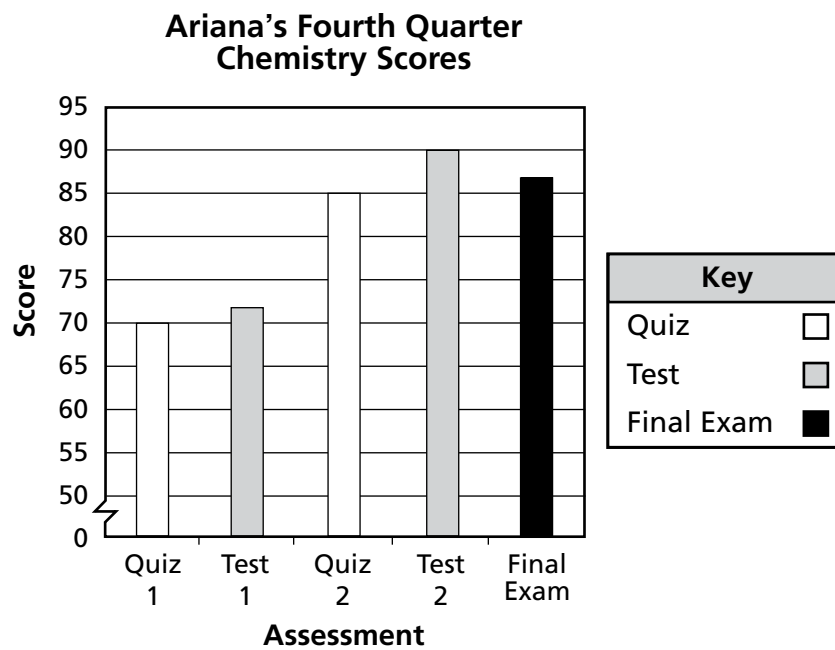
- 47** Which class has the greatest number of students enrolled?



- A** Morning  
**B** Afternoon  
**C** Evening  
**D** Afternoon and evening have equal enrollments.

GM010034

- 48** Ariana's scores from the fourth quarter of her chemistry class are shown below.



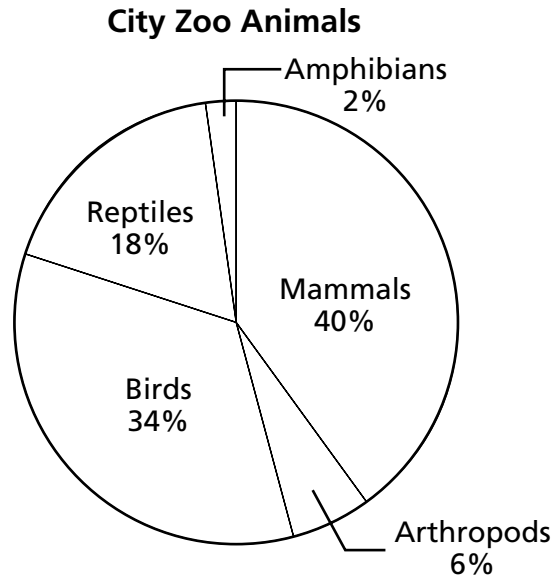
Which statement is best supported by the information in the graph?

- F** The difference between Ariana's quiz scores is the same as the difference between her test scores.
- G** Ariana's scores increased throughout the fourth quarter of her chemistry class.
- H** Ariana scored 15 points higher on the Final Exam than on Test 1.
- J** Ariana's Quiz 1 score is half of her Test 2 score.

GM020246

**Performance Indicator:** Interpret circle graphs (pie charts) representing real-world data.

- 49** The circle graph below shows the percentage of each type of animal at the city zoo.

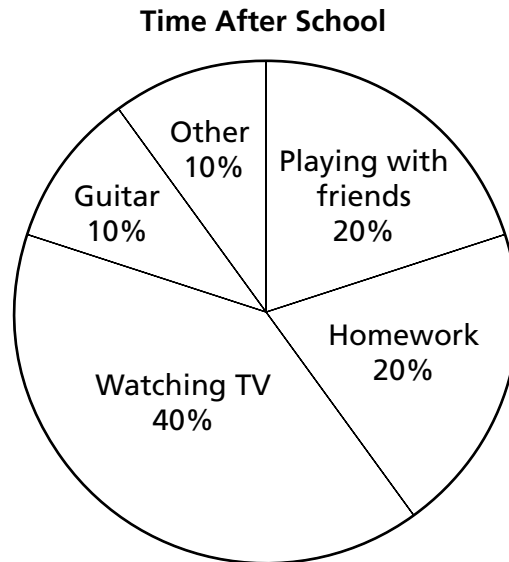


What percentage of animals at the zoo is birds or reptiles?

- A** 52%
- B** 46%
- C** 42%
- D** 36%

GM020327

- 50** The circle graph below shows how Tyler usually spends his time after school from 3:00 p.m. to 8:00 p.m. each day. How much time does he spend practicing guitar and doing homework?



- F** 0.2 hour  
**G** 0.3 hour  
**H** 1.0 hour  
**J** 1.5 hours

GM010190

**Performance Indicator:** Determine the median for a given set of real-world data (even number of data).

- 51** Mrs. Coleman is taking care of 6 puppies. She recorded the following weights (in pounds) for the 6 puppies.

6, 5.5, 5, 9, 9.5, 7

What is the median weight of the 6 puppies?

- A** 5.0 pounds  
**B** 6.5 pounds  
**C** 7.0 pounds  
**D** 9.5 pounds

GM010035



**Performance Indicator:** Select the system of equations that could be used to solve a given real-world problem.

- 52** Nick has two jobs. He earns \$11.50 per hour as an office assistant and \$9.25 per hour as a bookkeeper. Nick worked a total of 38 hours last week and earned \$392. Which system of equations can be used to determine the number of hours Nick worked as an office assistant,  $a$ , and as a bookkeeper,  $b$ ?

**F**  $a + b = 38$   
 $9.25a + 11.5b = 392$

**G**  $a + b = 20.75$   
 $9.25a + 11.5b = 392$

**H**  $a + b = 20.75$   
 $11.5a + 9.25b = 392$

**J**  $a + b = 38$   
 $11.5a + 9.25b = 392$

GM020200

**Performance Indicator:** Compute the probability of a simple compound event (2 independent events, no more than 6 possibilities per event).

- 53** Juan will be assigned at random to 1 of 5 math classes and to 1 of 3 history classes. Each math class and each history class is taught by a different teacher. What is the probability that Juan will be assigned to Mr. Wilkes' math class and Ms. Garrett's history class?

**A**  $\frac{1}{15}$

**B**  $\frac{1}{8}$

**C**  $\frac{1}{4}$

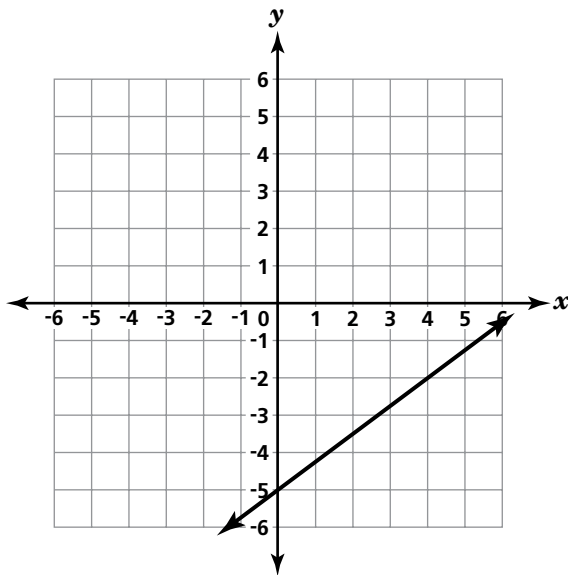
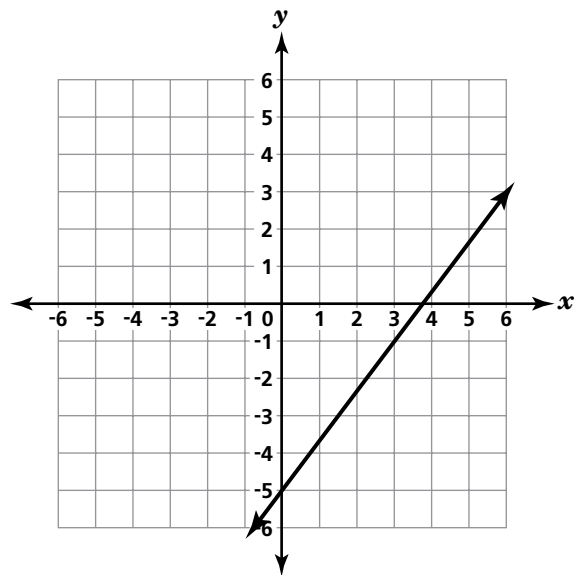
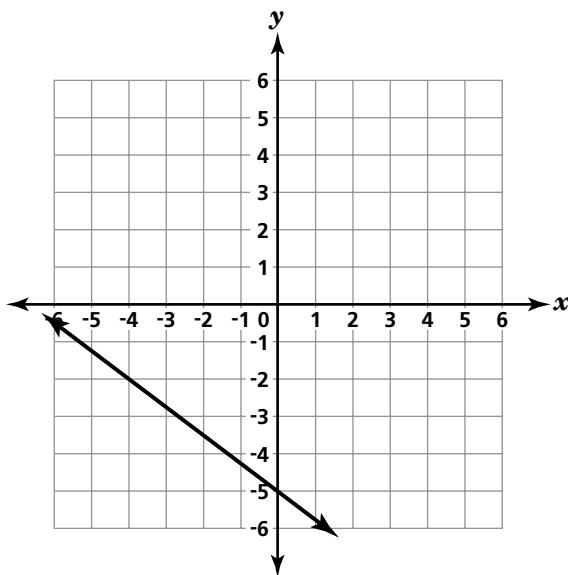
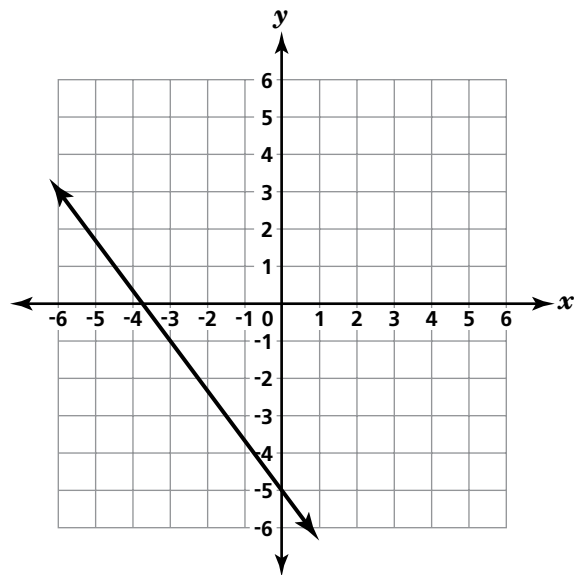
**D**  $\frac{8}{15}$

GM020078

**Reporting Category 5: Graphs and Graphing**  
Numbers 54 through 70

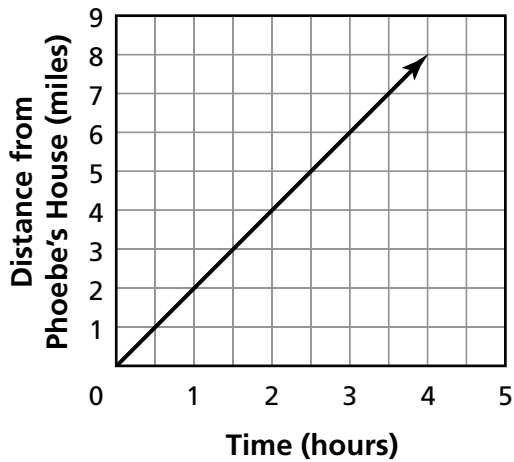
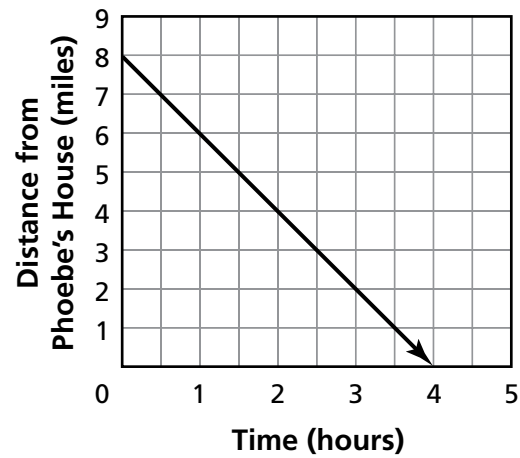
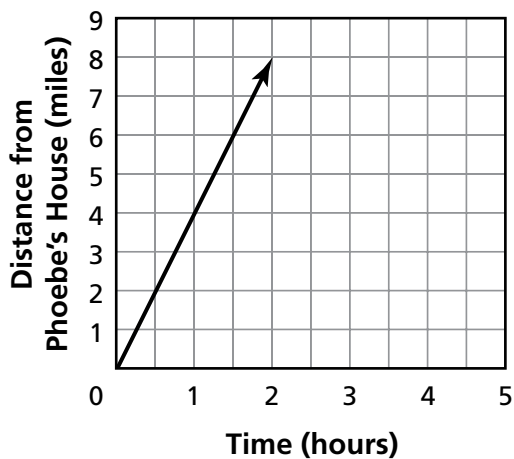
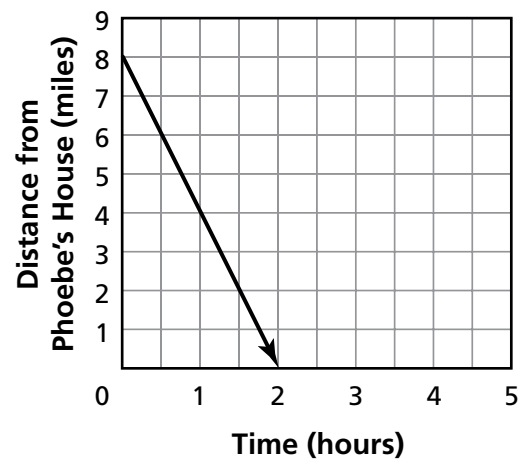
**Performance Indicator:** Select the graph that represents a given linear function expressed in slope-intercept form.

- 54** Which graph best represents  $y = -\frac{4}{3}x - 5$ ?

**F****H****G****J**

**Performance Indicator:** Select the linear graph that models the given real-world situation described in a narrative (no data set given).

- 55** Phoebe's house is 8 miles from the library. She walked from the library to her house at an average rate of 4 miles per hour. If she walked directly to her house from the library, which graph best represents her trip?

**A****C****B****D**

GM010264

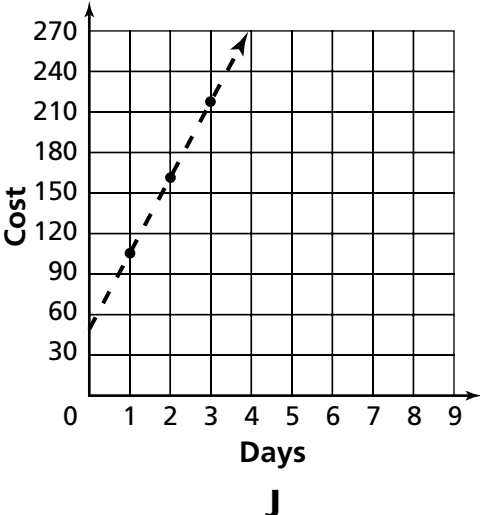
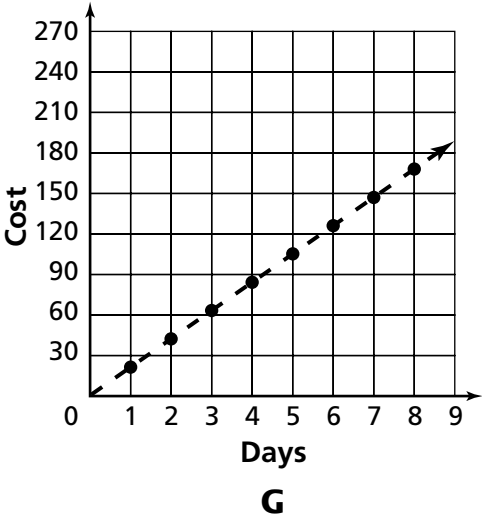
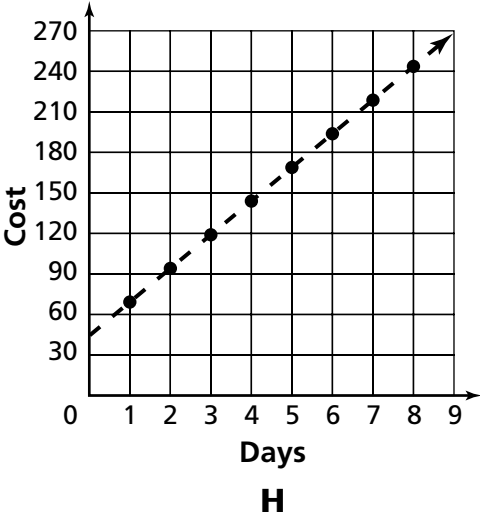
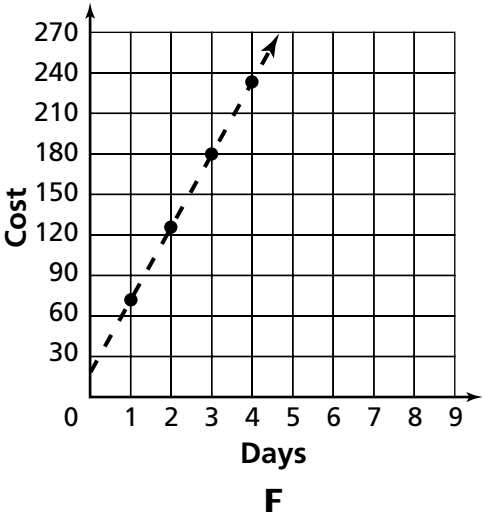
**Performance Indicator:** Select the linear graph that models the given real-world situation described in a tabular set of data or vice versa.

- 56** Oscar wants to know how much it will cost to rent a car. The salesman gave him this chart.

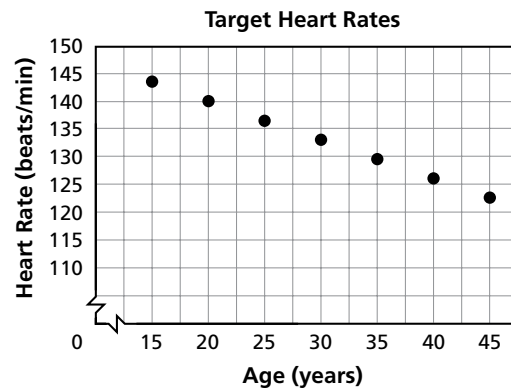
Cost of Rental

Days	Cost
1	\$70
3	\$120
7	\$220
8	\$245

Which graph shows the cost of a rental car as a function of the number of days it is rented?



- 57** The graph below shows the target heart rates during exercise for individuals based on their age.



Which table most closely matches the graph?

Age (years)	Heart Rate (beats/min)
45	143.5
40	140
35	136.5
30	133
25	129.5
20	126
15	122.5

**A**

Age (years)	Heart Rate (beats/min)
143.5	15
140	20
136.5	25
133	30
129.5	35
126	40
122.5	45

**C**

Age (years)	Heart Rate (beats/min)
15	143.5
20	140
25	136.5
30	133
35	129.5
40	126
45	122.5

**B**

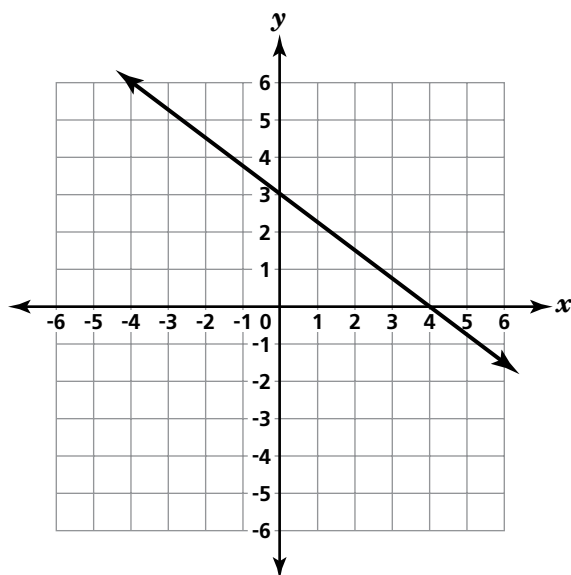
Age (years)	Heart Rate (beats/min)
143.5	45
140	40
136.5	35
133	30
129.5	25
126	20
122.5	15

**D**

GM020116

**Performance Indicator:** Determine the slope from the graph of a linear equation (no labeled points).

- 58** Which of the following best represents the slope of the line graphed on the coordinate plane below?



**F**  $-\frac{4}{3}$

**G**  $-\frac{3}{4}$

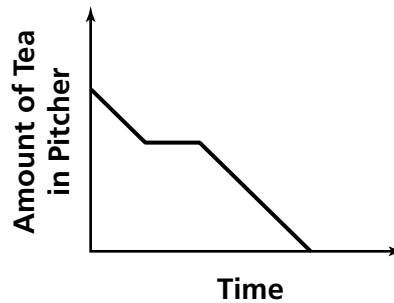
**H**  $\frac{3}{4}$

**J**  $\frac{4}{3}$

GM020080

**Performance Indicator:** Select the non-linear graph that models the given real-world situation or vice versa.

- 59** The graph below shows the amount of tea in Shelby's pitcher as a function of time.

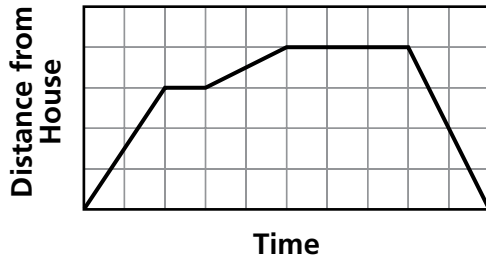
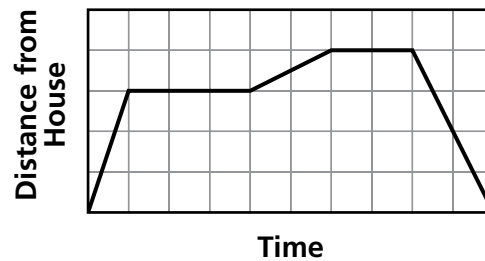
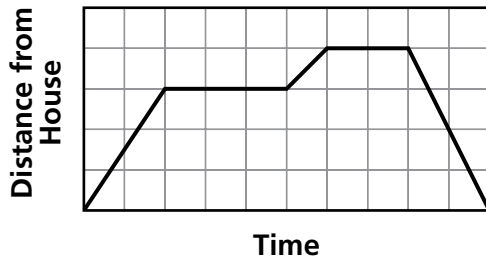
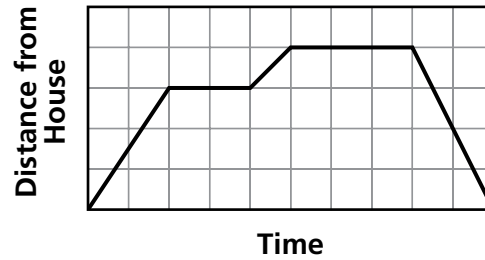


Which situation best matches the graph?

- A** Shelby poured 4 ounces from the full pitcher into a glass, drank it, and then poured the remaining 8 ounces from the pitcher.
- B** Shelby poured 4 ounces from the full pitcher into a glass, drank it, and then poured the remaining 2 ounces from the pitcher.
- C** Shelby poured 4 ounces into the empty pitcher from a glass, waited one minute, and then poured the remaining 8 ounces into the pitcher.
- D** Shelby poured 4 ounces into the empty pitcher from a glass, waited one minute, and then poured the remaining 2 ounces into the pitcher.

GM020326

- 60** Natalie walked to the fabric store from her house in 10 minutes, stayed there for 10 minutes, walked to the grocery store in 5 minutes, stayed there for 15 minutes, and then walked home. Which graph best shows the distance Natalie was from her house as she walked to the fabric store, the grocery store, and back home?

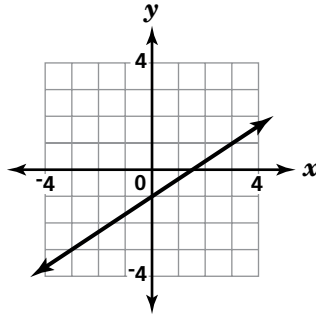
**F****H****G****J**

GM020329

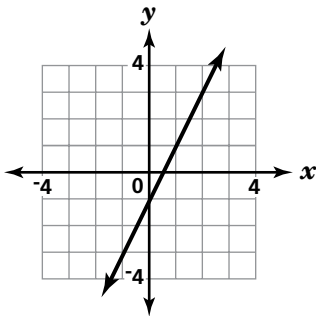
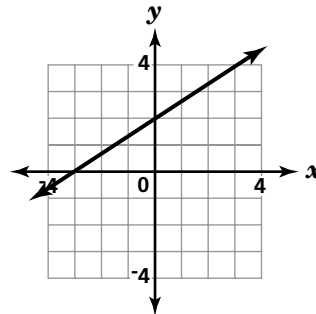
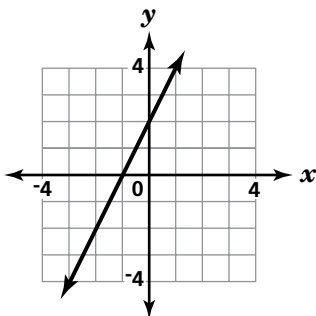
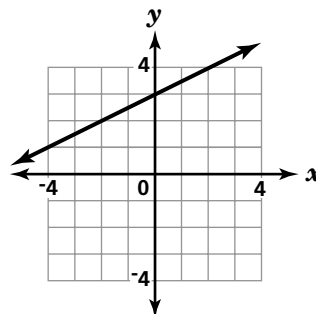


**Performance Indicator:** Recognize the graphical transformation that occurs when coefficients and/or constants of the corresponding linear equations are changed.

- 61** The graph of the line  $y = \frac{2}{3}x - 1$  is shown below.



If the constant ( $-1$ ) is increased by 3, which of the following best represents the graph of the resulting line?

**A****C****B****D**

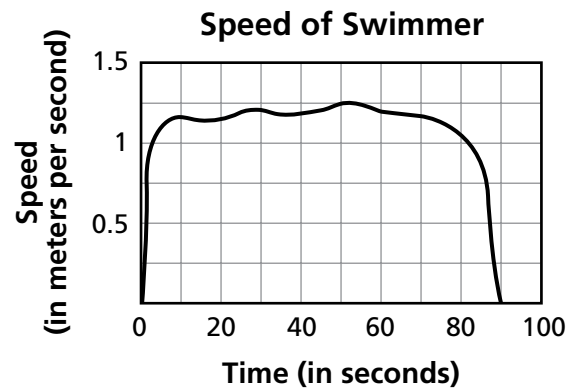
**62** What transformation occurs when  $y = 2x + 4$  is changed to  $y = 5x + 4$ ?

- F** The  $y$ -intercept decreases.
- G** The  $y$ -intercept increases.
- H** The slope decreases.
- J** The slope increases.

GM010047

**Performance Indicator:** Determine the domain and/or range of a function represented by the graph of real-world situations.

**63** The graph below represents the speed of a swimmer competing in a race as a function of time.

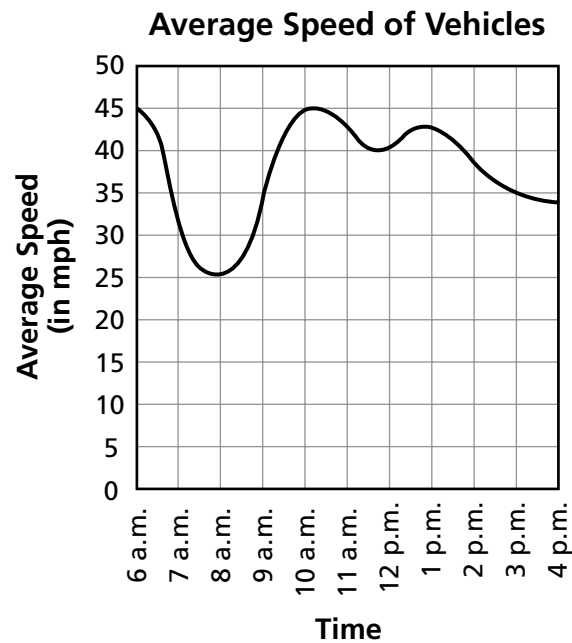


What is the domain ( $D$ ) of this function?

- A**  $0 \leq D \leq 1.25$
- B**  $0 \leq D \leq 1.5$
- C**  $0 \leq D \leq 90$
- D**  $0 \leq D \leq 100$

GM020161

- 64** The following graph shows the average speed of vehicles on the local highway as a function of time.



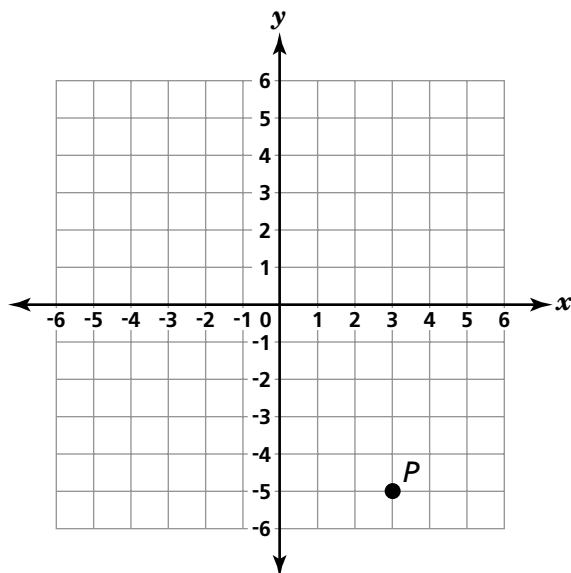
What is the range ( $R$ ) of this function?

- F**  $25.5 \text{ mph} \leq R \leq 45 \text{ mph}$   
**G**  $25.5 \text{ mph} \leq R \leq 34 \text{ mph}$   
**H**  $8 \text{ a.m.} \leq R \leq 10 \text{ a.m.}$   
**J**  $6 \text{ a.m.} \leq R \leq 4 \text{ p.m.}$

GM020282

**Performance Indicator:** Identify ordered pairs in the coordinate plane.

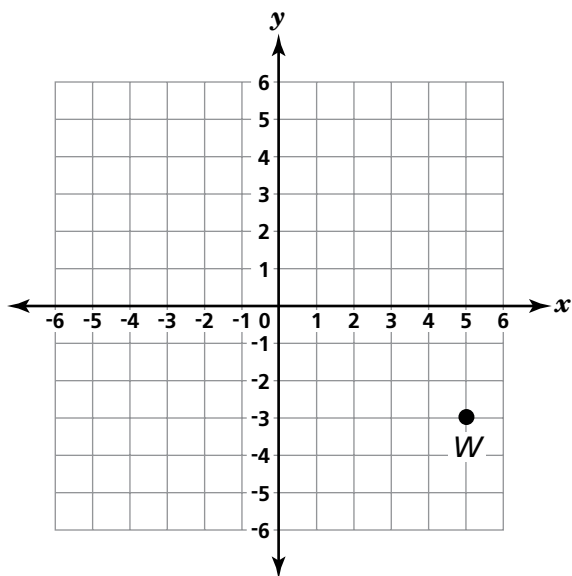
- 65** Which ordered pair best represents the coordinates of Point  $P$  on the graph?



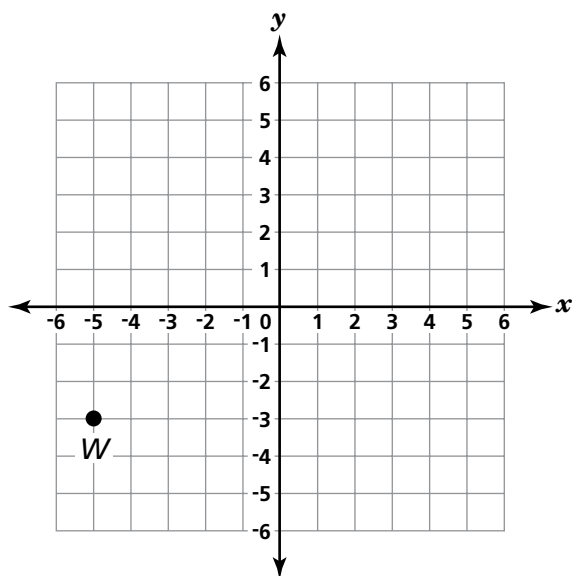
- A**  $(-5, 3)$
- B**  $(5, -3)$
- C**  $(3, -5)$
- D**  $(-3, 5)$

GM020085

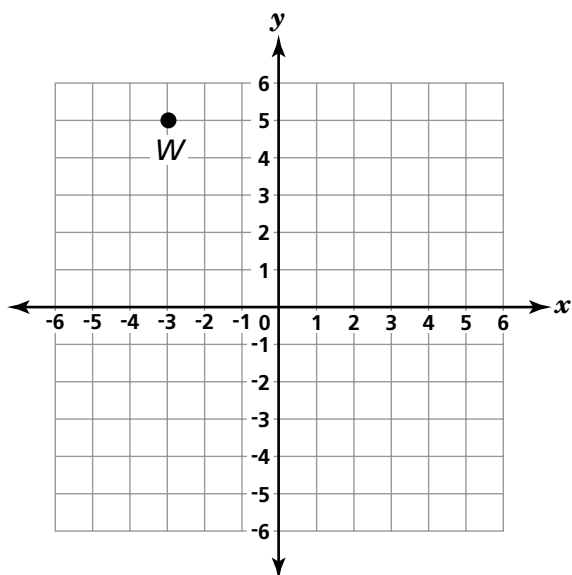
**66** Which graph shows Point  $W$  at  $(-3, -5)$ ?



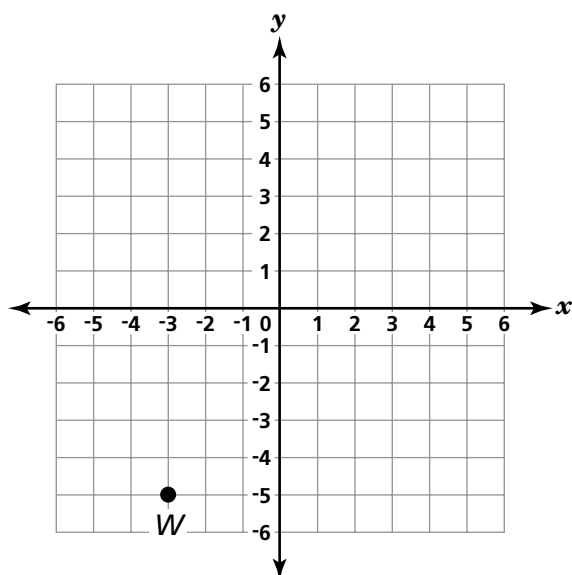
**F**



**H**



**G**

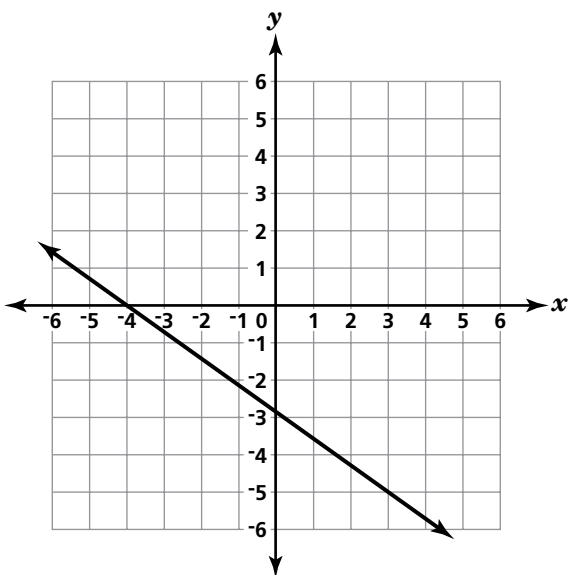
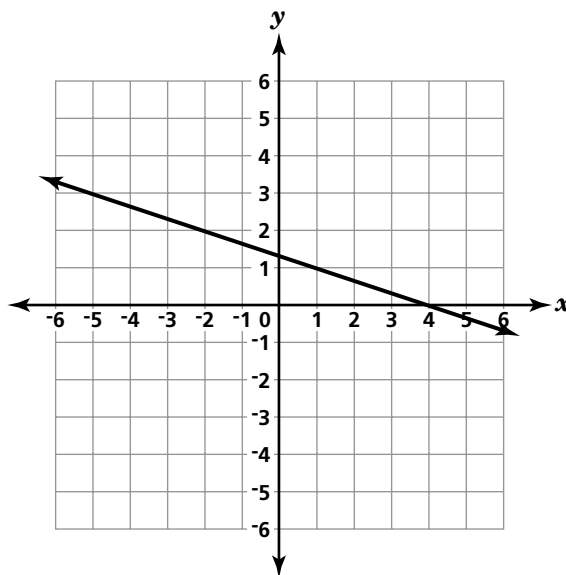
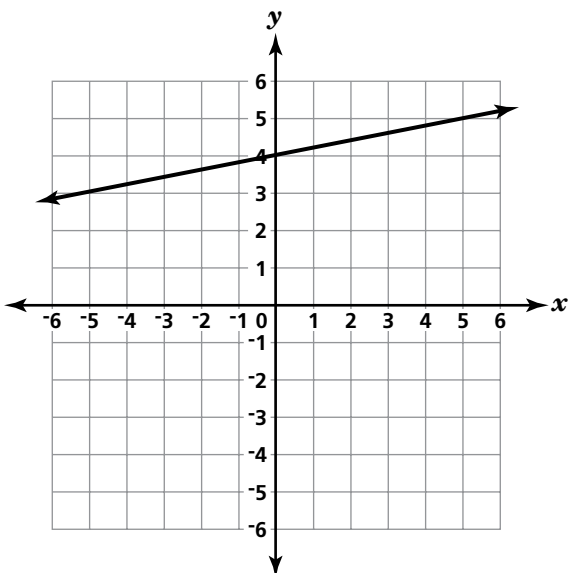
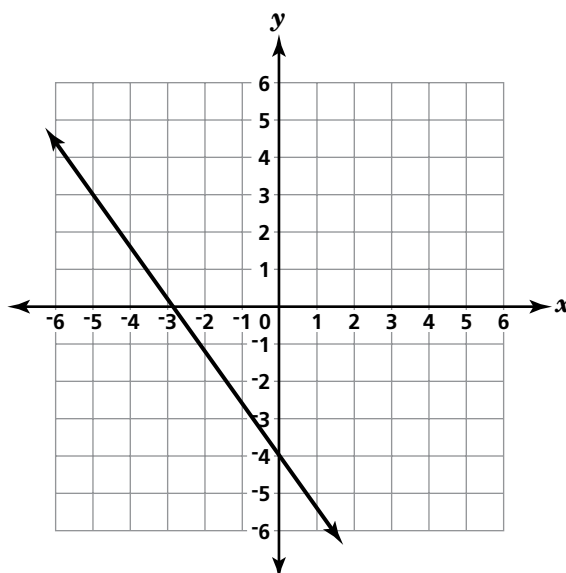


**J**

GM020331

**Performance Indicator:** Choose the matching linear graph given a set of ordered pairs.

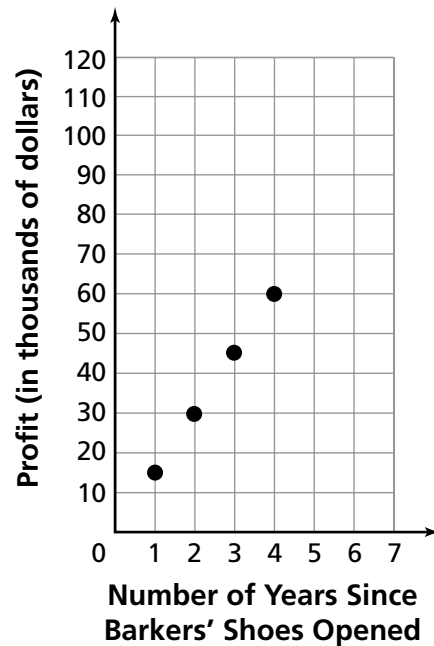
- 67** Which of the following best represents a line that contains the points  $(-5, 3)$  and  $(0, -4)$ ?

**A****C****B****D**

GM010176

**Performance Indicator:** Make a prediction from the graph of a real-world linear data set.

- 68** The graph below shows the profit of Barkers' Shoes for each year since the store opened.



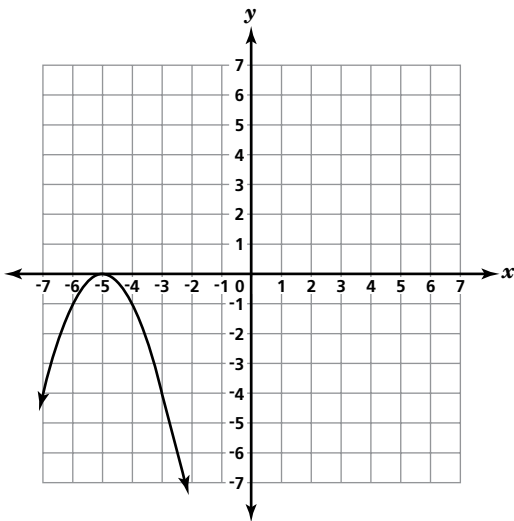
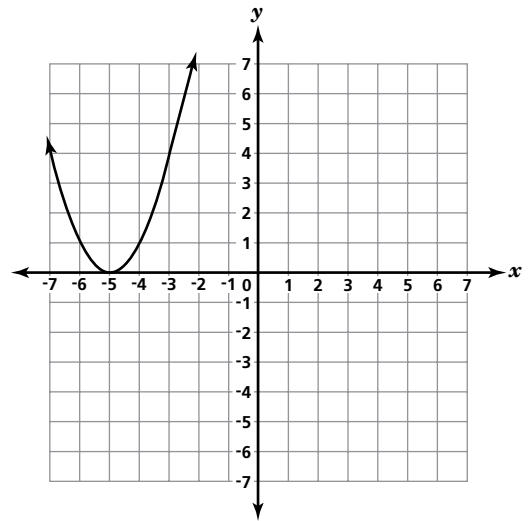
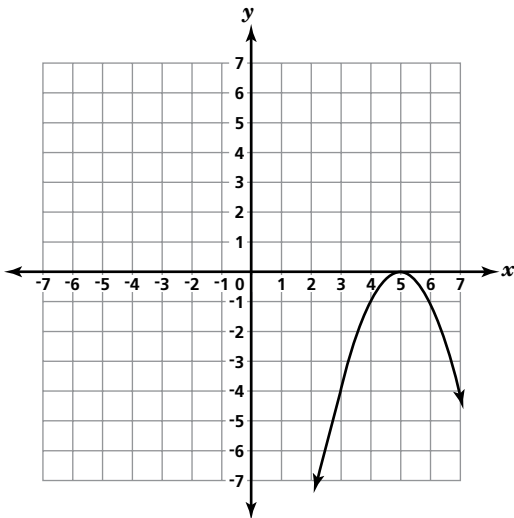
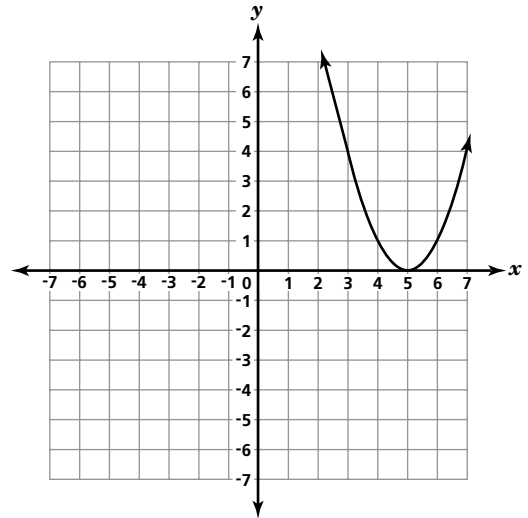
If the profit of Barkers' Shoes continues to increase at the same rate, what will be the profit, in thousands of dollars, for the seventh year?

- F** 120
- G** 105
- H** 90
- J** 75

GM020124

**Performance Indicator:** Select the solution to a quadratic equation given solutions represented in graphical form (integral solutions and a leading coefficient of one).

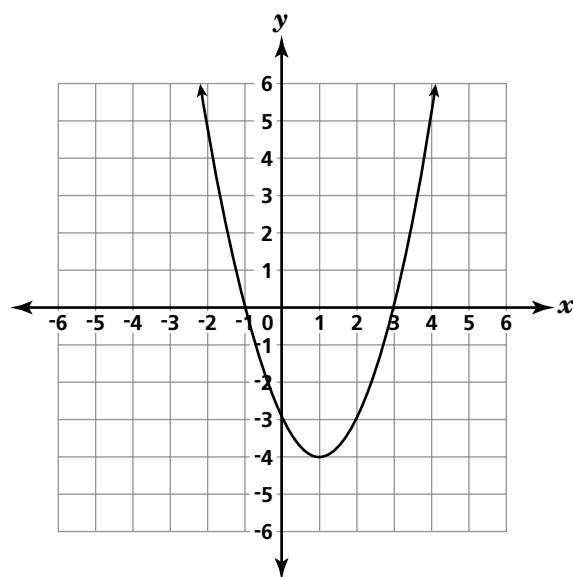
- 69** Which graph best represents the solution(s) to the quadratic function  $f(x) = x^2 - 10x + 25$ ?

**A****C****B****D**

GM020325



- 70** What are the solutions (roots) of the graph of this quadratic equation?



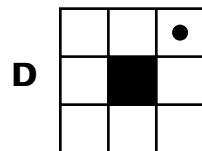
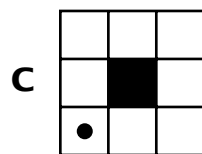
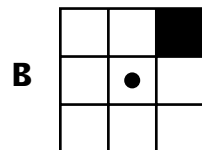
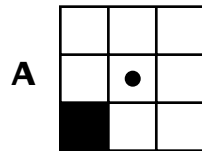
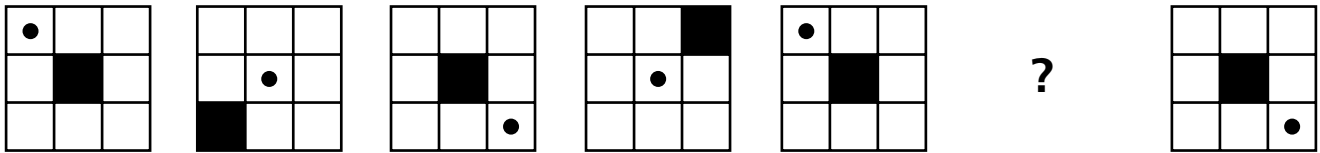
- F** 0 and 3  
**G** -3 and 0  
**H** -3 and 1  
**J** -1 and 3

GM020332

**Reporting Category 6:** Spatial Sense and Geometric Concepts  
Numbers 71 through 82

**Performance Indicator:** Extend a geometric pattern.

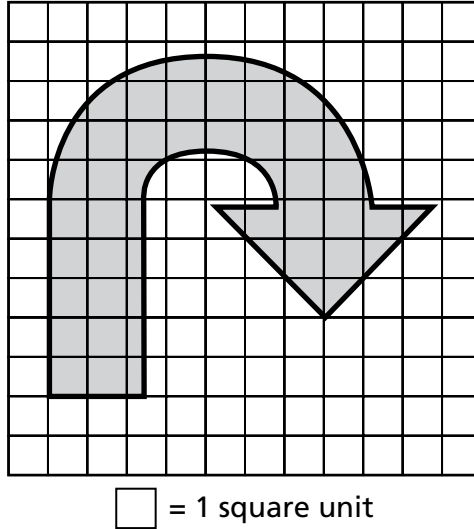
**71** What is the 6th figure in the pattern shown below?



GM020294

**Performance Indicator:** Estimate the area of irregular geometric figures on a grid.

- 72** Which estimate is closest to the area of the irregular figure shown on the grid below?

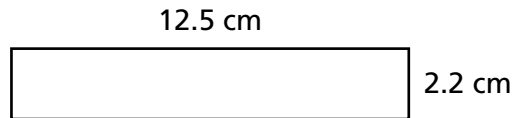


- F** 28 square units
- G** 42 square units
- H** 57 square units
- J** 100 square units

GM010195

**Performance Indicator:** Apply the given formula to determine the area or perimeter of a rectangle.

- 73** What is the area, in square centimeters ( $\text{cm}^2$ ), of the rectangle shown below?



- A**  $29.4 \text{ cm}^2$
- B**  $27.5 \text{ cm}^2$
- C**  $14.7 \text{ cm}^2$
- D**  $13.8 \text{ cm}^2$

GM010105

- 74** Mario has a rectangular yard that is 24 feet long and 50 feet wide. What is the perimeter of the yard, in feet?

- F** 74 feet
- G** 124 feet
- H** 148 feet
- J** 1,200 feet

GM010293

**Performance Indicator:** Apply the given formula to find the area of a circle, the circumference of a circle, or the volume of a rectangular solid.

- 75** Monique has a circular sticker with a circumference of approximately 19 inches. Which is closest to the area of the sticker, in square inches?

- A** 29 square inches
- B** 36 square inches
- C** 114 square inches
- D** 283 square inches

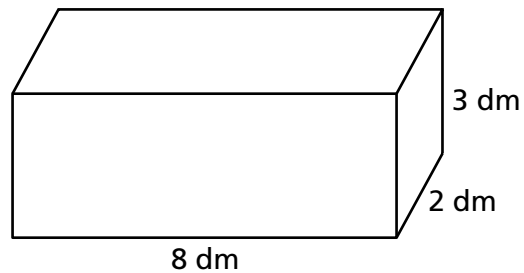
GM020213

- 76** Woodlawn Park has a circular running track with a diameter of 150 meters. Which is closest to the distance covered in one lap around the track?

**F** 153 meters  
**G** 236 meters  
**H** 471 meters  
**J** 942 meters

GM020088

**77**



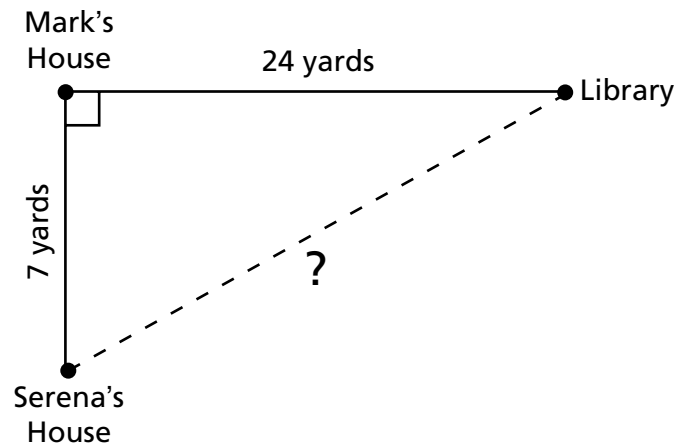
What is the volume of the rectangular prism shown?

**A**  $13 \text{ dm}^3$   
**B**  $16 \text{ dm}^3$   
**C**  $24 \text{ dm}^3$   
**D**  $48 \text{ dm}^3$

GM020328

**Performance Indicator:** Apply the given Pythagorean Theorem to a real-life problem illustrated by a diagram (no radicals in answer).

- 78** The figure below represents a map showing the locations of Serena's house, Mark's house, and the library.



**Note:** Figure is not drawn to scale.

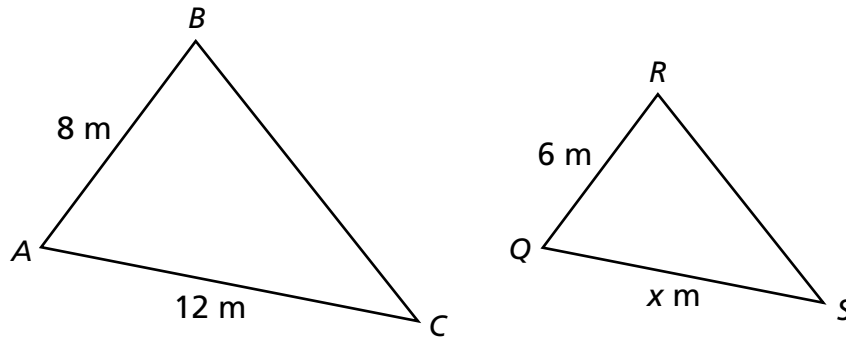
What is the shortest distance from Serena's house to the library?

- F** 17 yards
- G** 23 yards
- H** 25 yards
- J** 31 yards

GM010269

**Performance Indicator:** Apply proportion and the concepts of similar triangles to find the length of a missing side of a triangle.

- 79**  $\triangle ABC$  is similar to  $\triangle QRS$ .

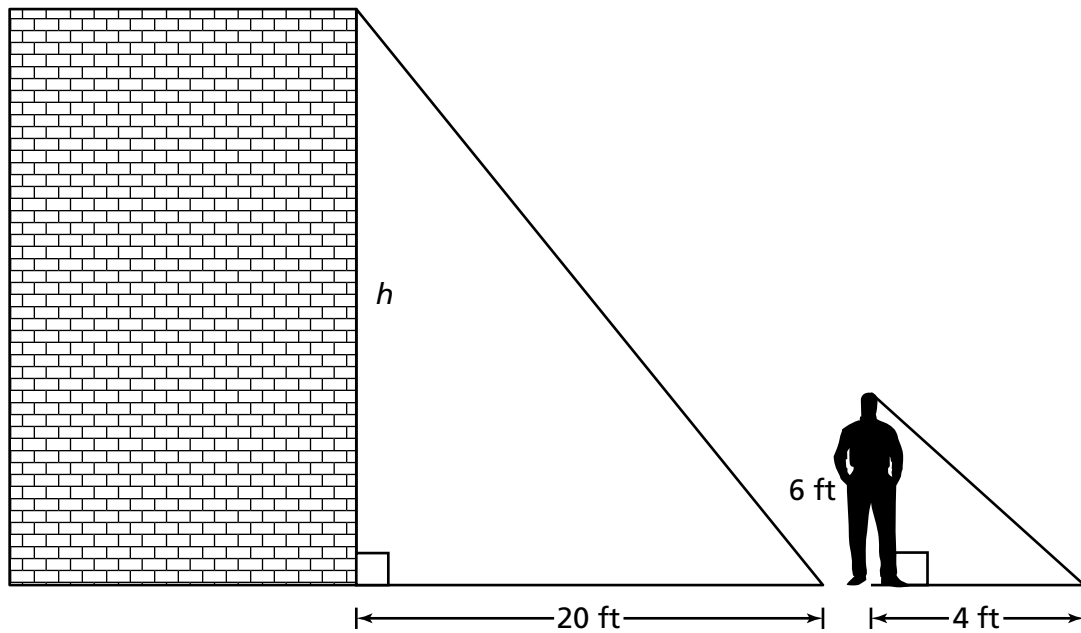


What is the value of  $x$  in  $\triangle QRS$ ?

- A** 10
- B** 9
- C** 4
- D** 3

GM010128

- 80** A man who is 6 feet tall casts a shadow that is 4 feet at the same time that a nearby building casts a shadow that is 20 feet.



Note: The figure is not drawn to scale.

What is  $h$ , the height of the building, in feet?

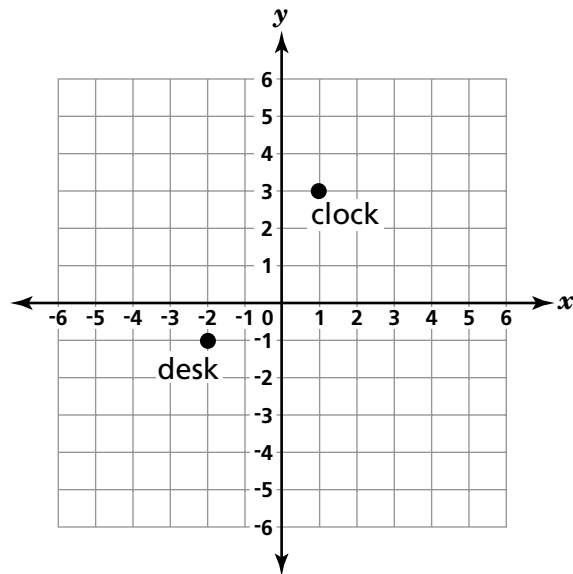
- F** 30 feet
- G** 26 feet
- H** 24 feet
- J** 15 feet

GM010199



**Performance Indicator:** Calculate the distance between two points given the Pythagorean Theorem and the distance formula.

- 81** The locations of a desk and a clock in a classroom are plotted on the grid shown below.

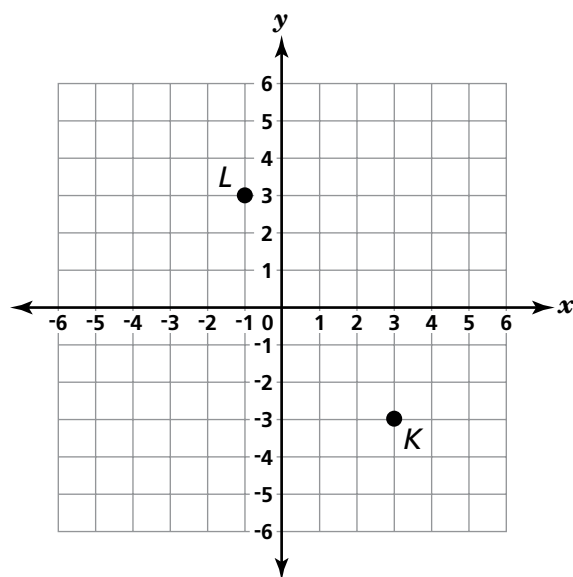


What is the distance between the desk and the clock if each unit on the grid represents one meter?

- A** 7 meters
- B** 6 meters
- C** 5 meters
- D** 4 meters

GM020330

- 82** What is the distance from Point  $K$  to Point  $L$  on the grid below?



- F** 10
- G**  $\sqrt{52}$
- H**  $\sqrt{40}$
- J** 6

GM020051

## Answer Key

<b>Reporting Category 1: Number Sense/Theory</b>		
<b>Item Number</b>	<b>Correct Answer</b>	<b>Performance Indicator</b>
<b>1</b>	<b>A</b>	GM1.1.A Select the best estimate for the coordinate of a given point on a number line (only rational).
<b>2</b>	<b>J</b>	GM1.1.B Identify the opposite of a rational number.
<b>3</b>	<b>A</b>	GM1.1.C Determine the square root of a perfect square less than 169.
<b>4</b>	<b>H</b>	GM1.2.A Order a given set of rational numbers (both fraction and decimal notations).
<b>5</b>	<b>B</b>	GM1.2.A Order a given set of rational numbers (both fraction and decimal notations).
<b>6</b>	<b>H</b>	GM1.2.B Identify the reciprocal of a rational number.
<b>7</b>	<b>D</b>	GM1.2.F Select ratios and proportions to represent real-world problems (e.g., scale drawings, sampling, etc.).
<b>8</b>	<b>H</b>	GM1.2.F Select ratios and proportions to represent real-world problems (e.g., scale drawings, sampling, etc.).
<b>9</b>	<b>A</b>	GM1.2.F Select ratios and proportions to represent real-world problems (e.g., scale drawings, sampling, etc.).
<b>10</b>	<b>F</b>	GM1.1.E Apply order of operations when computing with integers using no more than two sets of grouping symbols and exponents 1 and 2.
<b>11</b>	<b>C</b>	GM1.1.E Apply order of operations when computing with integers using no more than two sets of grouping symbols and exponents 1 and 2.
<b>12</b>	<b>G</b>	GM1.1.F Select a reasonable solution for a real-world division problem in which the remainder must be considered.
<b>13</b>	<b>B</b>	GM1.2.E Use estimation to determine a reasonable solution for a tedious arithmetic computation.
<b>14</b>	<b>H</b>	GM1.2.E Use estimation to determine a reasonable solution for a tedious arithmetic computation.

## Answer Key

<b>Reporting Category 2: Algebraic Expressions</b>		
<b>Item Number</b>	<b>Correct Answer</b>	<b>Performance Indicator</b>
<b>15</b>	<b>B</b>	GM1.1.D Use exponents to simplify a monomial written in expanded form without the use of parentheses.
<b>16</b>	<b>F</b>	GM1.2.C Add and subtract algebraic expressions.
<b>17</b>	<b>B</b>	GM1.2.C Add and subtract algebraic expressions.
<b>18</b>	<b>F</b>	GM1.2.D Multiply two polynomials with each factor having no more than two terms.
<b>19</b>	<b>B</b>	GM4.3.A Select the area representation for a given product of two one-variable binomials with positive constants and coefficients.
<b>20</b>	<b>F</b>	GM2.1.B Extend a numerical pattern.
<b>21</b>	<b>D</b>	GM2.1.B Extend a numerical pattern.
<b>22</b>	<b>G</b>	GM2.1.C Translate a verbal expression into an algebraic expression or vice versa.
<b>23</b>	<b>C</b>	GM2.1.C Translate a verbal expression into an algebraic expression or vice versa.
<b>24</b>	<b>F</b>	GM2.1.D Evaluate a first-degree algebraic expression given values for one or more variables.
<b>25</b>	<b>B</b>	GM2.2.I Evaluate an algebraic expression given values for one or more variables using grouping symbols and/or exponents less than four.

## Answer Key

<b>Reporting Category 3: Equations and Inequalities</b>		
<b>Item Number</b>	<b>Correct Answer</b>	<b>Performance Indicator</b>
<b>26</b>	<b>J</b>	GM2.1.E Solve one- and two-step linear equations using integers (with integral coefficients and constants).
<b>27</b>	<b>C</b>	GM2.2.A Select the algebraic notation which generalizes the pattern represented by data in a given table.
<b>28</b>	<b>J</b>	GM2.2.B Translate a verbal sentence into an algebraic equation or vice versa.
<b>29</b>	<b>A</b>	GM2.2.B Translate a verbal sentence into an algebraic equation or vice versa.
<b>30</b>	<b>G</b>	GM2.2.D Solve multi-step linear equations (more than two steps, variables on one side of the equation with no use of parentheses).
<b>31</b>	<b>C</b>	GM2.2.E Solve multi-step linear equations (more than two steps, with variables on both sides of the equation with no use of parentheses).
<b>32</b>	<b>J</b>	GM2.2.F Solve multi-step linear equations (more than two steps, with one set of parentheses on each side of the equation).
<b>33</b>	<b>A</b>	GM2.2.L Select the appropriate graphical representation on the coordinate plane of a given linear inequality (given in standard form or slope-intercept form).
<b>34</b>	<b>J</b>	GM2.2.L Select the appropriate graphical representation on the coordinate plane of a given linear inequality (given in standard form or slope-intercept form).
<b>35</b>	<b>C</b>	GM2.2.N Identify the graphical representation of the solution to a one-variable inequality on a number line.
<b>36</b>	<b>F</b>	GM2.2.N Identify the graphical representation of the solution to a one-variable inequality on a number line.
<b>37</b>	<b>B</b>	GM2.3.E Find the solution to a quadratic equation given in standard form (integral solutions and a leading coefficient of one).
<b>38</b>	<b>J</b>	GM2.3.G Select one of the factors (e.g., $x + 3$ ) of a quadratic equation (integral solutions and a leading coefficient of one).
<b>39</b>	<b>A</b>	GM2.3.H Select the discriminant of a quadratic equation (integral solutions and a leading coefficient of one).

## Answer Key

<b>Reporting Category 4: Real-World Problems</b>		
<b>Item Number</b>	<b>Correct Answer</b>	<b>Performance Indicator</b>
<b>40</b>	<b>J</b>	GM1.3.A Apply the concept of slope to represent rate of change in a real-world situation.
<b>41</b>	<b>A</b>	GM1.3.A Apply the concept of slope to represent rate of change in a real-world situation.
<b>42</b>	<b>G</b>	GM4.1.B Calculate rates involving cost per unit to determine the best buy (no more than four samples).
<b>43</b>	<b>C</b>	GM2.2.K Apply the concept of rate of change to solve real-world problems.
<b>44</b>	<b>G</b>	GM2.3.A Solve multi-step linear inequalities in real-world situations.
<b>45</b>	<b>D</b>	GM2.3.A Solve multi-step linear inequalities in real-world situations.
<b>46</b>	<b>H</b>	GM5.1.A Determine the mean (average) of a given set of real-world data (no more than five two-digit numbers).
<b>47</b>	<b>B</b>	GM5.1.B Interpret bar graphs representing real-world data.
<b>48</b>	<b>H</b>	GM5.1.B Interpret bar graphs representing real-world data.
<b>49</b>	<b>A</b>	GM5.1.C Interpret circle graphs (pie charts) representing real-world data.
<b>50</b>	<b>J</b>	GM5.1.C Interpret circle graphs (pie charts) representing real-world data.
<b>51</b>	<b>B</b>	GM5.2.C Determine the median for a given set of real-world data (even number of data).
<b>52</b>	<b>J</b>	GM2.3.D Select the system of equations that could be used to solve a given real-world problem.
<b>53</b>	<b>A</b>	GM5.3.B Compute the probability of a simple compound event (2 independent events, no more than 6 possibilities per event).

## Answer Key

<b>Reporting Category 5: Graphs and Graphing</b>		
<b>Item Number</b>	<b>Correct Answer</b>	<b>Performance Indicator</b>
54	J	GM2.2.C Select the graph that represents a given linear function expressed in slope-intercept form.
55	D	GM2.2.G Select the linear graph that models the given real-world situation described in a narrative (no data set given).
56	H	GM2.2.H Select the linear graph that models the given real-world situation described in a tabular set of data or vice versa.
57	B	GM2.2.H Select the linear graph that models the given real-world situation described in a tabular set of data or vice versa.
58	G	GM2.2.J Determine the slope from the graph of a linear equation (no labeled points).
59	A	GM2.2.M Select the non-linear graph that models the given real-world situation or vice versa.
60	J	GM2.2.M Select the non-linear graph that models the given real-world situation or vice versa.
61	C	GM2.3.B Recognize the graphical transformation that occurs when coefficients and/or constants of the corresponding linear equations are changed.
62	J	GM2.3.B Recognize the graphical transformation that occurs when coefficients and/or constants of the corresponding linear equations are changed.
63	C	GM2.3.C Determine the domain and/or range of a function represented by the graph of real-world situations.
64	F	GM2.3.C Determine the domain and/or range of a function represented by the graph of real-world situations.
65	C	GM3.1.A Identify ordered pairs in the coordinate plane.
66	J	GM3.1.A Identify ordered pairs in the coordinate plane.
67	D	GM5.2.A Choose the matching linear graph given a set of ordered pairs.
68	G	GM5.2.B Make a prediction from the graph of a real-world linear data set.
69	D	GM2.3.F Select the solution to a quadratic equation given solutions represented in graphical form (integral solutions and a leading coefficient of one).
70	J	GM2.3.F Select the solution to a quadratic equation given solutions represented in graphical form (integral solutions and a leading coefficient of one).

## Answer Key

<b>Reporting Category 6: Spatial Sense and Geometric Concepts</b>		
<b>Item Number</b>	<b>Correct Answer</b>	<b>Performance Indicator</b>
<b>71</b>	<b>A</b>	GM2.1.A Extend a geometric pattern.
<b>72</b>	<b>G</b>	GM4.1.A Estimate the area of irregular geometric figures on a grid.
<b>73</b>	<b>B</b>	GM4.1.C Apply the given formula to determine the area or perimeter of a rectangle.
<b>74</b>	<b>H</b>	GM4.1.C Apply the given formula to determine the area or perimeter of a rectangle.
<b>75</b>	<b>A</b>	GM4.2.A Apply the given formula to find the area of a circle, the circumference of a circle, or the volume of a rectangular solid.
<b>76</b>	<b>H</b>	GM4.2.A Apply the given formula to find the area of a circle, the circumference of a circle, or the volume of a rectangular solid.
<b>77</b>	<b>D</b>	GM4.2.A Apply the given formula to find the area of a circle, the circumference of a circle, or the volume of a rectangular solid.
<b>78</b>	<b>H</b>	GM3.2.A Apply the given Pythagorean Theorem to a real-life problem illustrated by a diagram (no radicals in answer).
<b>79</b>	<b>B</b>	GM3.2.B Apply proportion and the concepts of similar triangles to find the length of a missing side of a triangle.
<b>80</b>	<b>F</b>	GM3.2.B Apply proportion and the concepts of similar triangles to find the length of a missing side of a triangle.
<b>81</b>	<b>C</b>	GM3.3.A Calculate the distance between two points given the Pythagorean Theorem and the distance formula.
<b>82</b>	<b>G</b>	GM3.3.A Calculate the distance between two points given the Pythagorean Theorem and the distance formula.